



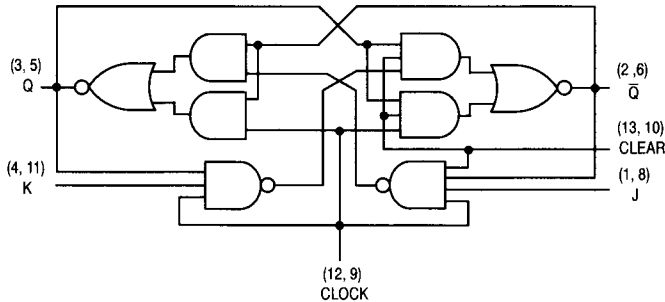
MOTOROLA

Dual J-K Flip-Flop With Clear

**ELECTRICALLY TESTED PER:
MIL-M-38510/30108**

The 54LS107A is a Dual J-K flip-flop with individual J, K, Direct Clear and Clock Pulse inputs. Output changes are initiated by the HIGH to LOW transition of the clock. A LOW signal on CD input overrides the other inputs and makes the Q output LOW.

LOGIC DIAGRAM
(one half shown)



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

MODE SELECT — TRUTH TABLE						
Operating Mode	Inputs			Outputs		
	\overline{C}_D	J	K	Q	\overline{Q}	
Reset (Clear)	L	X	X	L	H	
Toggle	H	h	h	\overline{q}	q	
Load "0" (Reset)	H	l	h	L	H	
Load "1" (Set)	H	h	l	H	L	
Hold	H	l	l	q	\overline{q}	

H, h = HIGH Voltage Level
L, l = LOW Voltage Level
X = Don't Care
l, h (q) = Lower case letters indicate the state of referenced input (or output) one set-up time prior to the HIGH to LOW clock transition.

Military 54LS107A



AVAILABLE AS:

- 1) JAN: JM38510/30108BXA
- 2) SMD: N/A
- 3) 883: 54LS107A/BXAJC

**X = CASE OUTLINE AS FOLLOWS:
PACKAGE: CERDIP: C
CERFLAT: D
LCC: 2**

**THE LETTER "M" APPEARS
BEFORE THE / ON LCC.**

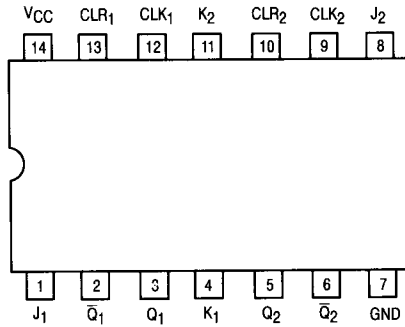
PIN ASSIGNMENTS

FUNCT.	DIL 632-08	FLATS 717-04	LCC 756A-02	BURN-IN (COND. A)
J ₁	1	1	2	VCC
\overline{Q}_1	2	2	3	VCC
Q ₁	3	3	4	OPEN
K ₁	4	4	6	VCC
Q ₂	5	5	8	OPEN
\overline{Q}_2	6	6	9	VCC
GND	7	7	10	GND
J ₂	8	8	12	VCC
CLK ₂	9	9	13	VCC
CLR ₂	10	10	14	GND
K ₂	11	11	16	VCC
CLK ₁	12	12	18	VCC
CLR ₁	13	13	19	GND
VCC	14	14	20	VCC

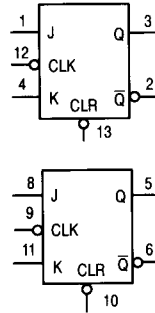
**BURN-IN CONDITIONS:
VCC = 5.0 V MIN/6.0 MAX**

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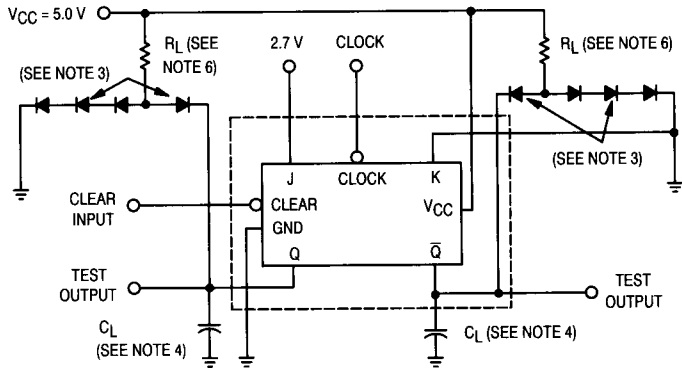
CONNECTION DIAGRAM



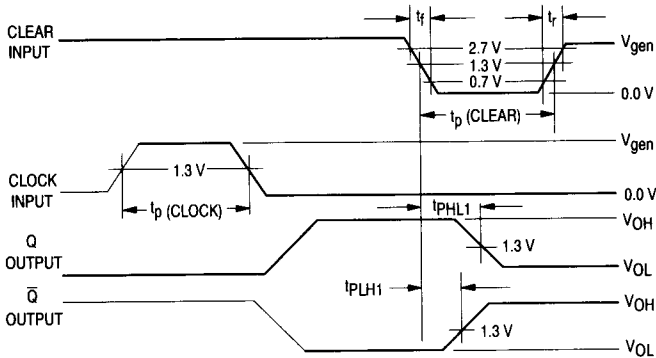
LOGIC SYMBOL



AC TEST CIRCUIT



WAVEFORMS

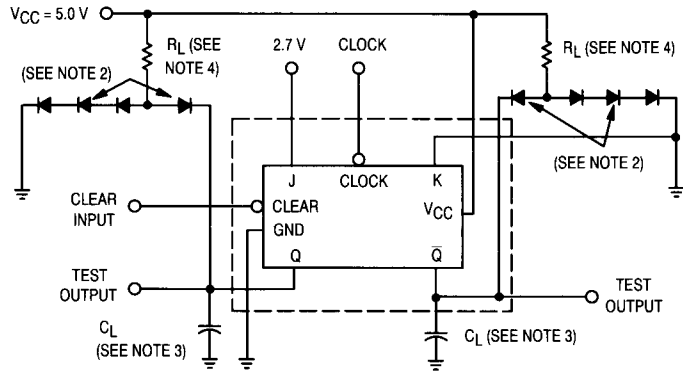


NOTES:

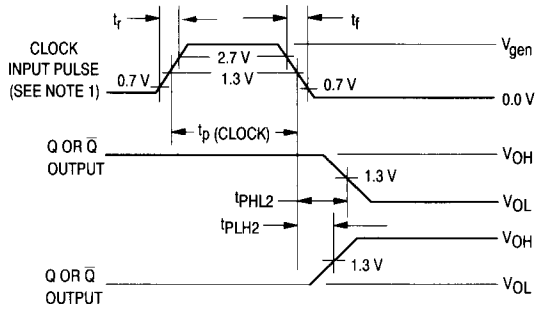
1. Clear inputs dominate regardless of the state of the clock or J-K inputs.
2. Clear input pulse characteristics:
 $V_{gen} = 3.0\text{ V}$, $t_r \leq 15\text{ ns}$, $t_f \leq 6.0\text{ ns}$,
 $t_p(\text{clear}) = 30\text{ ns}$, $\text{PRR} \leq 1.0\text{ MHz}$.
3. All diodes are 1N3064, or equivalent.
4. $C_L = 50\text{ pF} \pm 10\%$ (including jig and probe capacitance).
5. Voltage measurements are to be made with respect to network ground terminal.
6. $R_L = 2.0\text{ k}\Omega \pm 5.0\%$.
7. Clock input pulse characteristics:
 $V_{gen} = 3.0\text{ V}$, $t_p(\text{clock}) = 25\text{ ns}$,
 $\text{PRR} \leq 1.0\text{ MHz}$.

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AC TEST CIRCUIT



WAVEFORMS



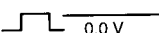
NOTES:

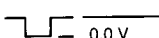
1. Clock input characteristics for t_{PLH} , t_{PHL} (clock to output):
 $V_{gen} = 3.0 \text{ V}$, $t_r \leq 15 \text{ ns}$, $t_f = 6.0 \text{ ns}$, $t_p \text{ (clock)} = 25 \text{ ns}$ and $PRR \leq 1.0 \text{ MHz}$. When testing f_{MAX} the clock input characteristics are: $V_{gen} = 3.0 \text{ V}$, $t_r = t_f \leq 6.0 \text{ ns}$, $t_p \text{ (clock)} \leq 20 \text{ ns}$ and $PRR = \text{see table}$.
2. All diodes are 1N3064, or equivalent.
3. $C_L = 50 \text{ pF} \pm 10\%$ (including jig and probe capacitance).
4. $R_L = 2.0 \text{ k}\Omega \pm 5.0\%$.

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Symbol	Parameter	Limits						Unit	Test Condition (Unless Otherwise Specified)
		+ 25°C		+ 125°C		- 55°C			
		Subgroup 1		Subgroup 2		Subgroup 3			
		Min	Max	Min	Max	Min	Max		
V _{OH}	Logical "1" Output Voltage	2.5		2.5		2.5		V	V _{CC} = 4.5 V, I _{OH} = -0.4 mA, V _{IN} = 2.0 V, V _{IL} = 0.7 V.
V _{OL}	Logical "0" Output Voltage		0.4		0.4		0.4	V	V _{CC} = 4.5 V, I _{OL} = 4.0 mA, V _{IH} = 2.0 V, V _{IL} = 0.7 V.
V _{IC}	Input Clamping Voltage		-1.5					V	V _{CC} = 4.5 V, I _{IL} = -18 mA, other inputs are open.
I _{IH}	Logical "1" Input Current (J & K inputs)		20		20		20	μA	V _{CC} = 5.5 V, V _{IH} = 2.7 V, other input = 4.5 V, CLK & CLR = GND.
I _{IHH}	Logical "1" Input Current (J & K inputs)		100		100		100	μA	V _{CC} = 5.5 V, V _{IHH} = 5.5 V, other input = 4.5 V, CLK & CLR = GND.
I _{IH}	Logical "1" Input Current (CLR inputs)		60		60		60	μA	V _{CC} = 5.5 V, V _{IH} = 2.7 V, other input = 4.5 V, CLK & J = GND.
I _{IHH}	Logical "1" Input Current (CLR inputs)		300		300		300	μA	V _{CC} = 5.5 V, V _{IHH} = 5.5 V, other input = 4.5 V, CLK & J = GND.
I _{IH}	Logical "1" Input Current (CLK inputs)		80		80		80	μA	V _{CC} = 5.5 V, V _{IH} = 2.7 V, CLR - K & J = GND.
I _{IHH}	Logical "1" Input Current (CLK inputs)		400		400		400	μA	V _{CC} = 5.5 V, V _{IHH} = 5.5 V, CLR - K & J = GND.
I _{IL}	Logical "0" Input Current (J & K inputs)	-0.12	-0.36	-0.12	-0.36	-0.12	-0.36	mA	V _{CC} = 5.5 V, V _{IL} = 0.4 V, CLR & J = 4.5 V, CLK = (See Note 2).
I _{IL}	Logical "0" Input Current (CLK inputs)	-0.24	-0.72	-0.24	-0.72	-0.24	-0.72	mA	V _{CC} = 5.5 V, V _{IL} = 0.4 V, J & K = 4.5 V, CLR = (See Note 2).
I _{IL}	Logical "0" Input Current (CLR inputs)	-0.12	-0.72	-0.12	-0.72	-0.12	-0.72	mA	V _{CC} = 5.5 V, V _{IL} = 0.4 V, CLK - J & K = 4.5 V.
I _{OS}	Output Short Circuit Current	-15	-100	-15	-100	-15	-100	mA	V _{CC} = 5.5 V, V _{IN} = 4.5 V, CLK - CLR & J = GND, V _{OUT} = 2.25 V.
I _{CC}	Power Supply Current		8.0		8.0		8.0	mA	V _{CC} = 5.5 V, V _{IN} = 0 V (all inputs), or V _{IN} = 5.5 V, other inputs = 0 V.
V _{IH}	Logical "1" Input Voltage	2.0		2.0		2.0		V	V _{CC} = 4.5 V.
V _{IL}	Logical "0" Input Voltage		0.7		0.7		0.7	V	V _{CC} = 4.5 V.
	Functional Tests	Subgroup 7		Subgroup 8A		Subgroup 8B			per Truth Table with V _{CC} = 4.5 V, V _{INL} = 0.4 V, and V _{INH} = 2.5 V.

NOTES:

1. =  2.5 V min/5.5 V max

2. =  2.5 V min/5.5 V max

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Symbol	Parameter	Limits						Unit	Test Condition (Unless Otherwise Specified)
		+ 25°C		+ 125°C		- 55°C			
		Subgroup 9		Subgroup 10		Subgroup 11			
		Min	Max	Min	Max	Min	Max		
t _{PHL1} t _{PHL1}	Propagation Delay /Data-Output Output <u>High-Low</u>	5.0 —	28 20	5.0 —	40 35	5.0 —	40 35	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 2.0 kΩ ± 5.0%. V _{CC} = 5.0 V, C _L = 15 pF, R _L = 2.0 kΩ ± 5.0%.
t _{PLH1} t _{PLH1}	Propagation Delay /Data-Output Output <u>Low-High</u>	5.0 —	21 20	5.0 —	32 27	5.0 —	32 27	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 2.0 kΩ ± 5.0%. V _{CC} = 5.0 V, C _L = 15 pF, R _L = 2.0 kΩ ± 5.0%.
t _{PHL2} t _{PHL2}	Propagation Delay /Data-Output Output <u>High-Low</u>	5.0 —	30 20	5.0 —	42 37	5.0 —	42 37	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 2.0 kΩ ± 5.0%. V _{CC} = 5.0 V, C _L = 15 pF, R _L = 2.0 kΩ ± 5.0%.
t _{PLH2} t _{PLH2}	Propagation Delay /Data-Output Output <u>Low-High</u>	5.0 —	22 20	5.0 —	32 27	5.0 —	32 27	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 2.0 kΩ ± 5.0%. V _{CC} = 5.0 V, C _L = 15 pF, R _L = 2.0 kΩ ± 5.0%.
f _{MAX}	Maximum Clock Frequency	25		25		25		MHz	V _{CC} = 5.0 V, V _{IN} = 2.7 V, C _L = 50 pF, R _L = 2.0 kΩ ± 5.0%.
f _{MAX}	Maximum Clock Frequency	30						MHz	V _{CC} = 5.0 V, C _L = 15 pF, R _L = 2.0 kΩ ± 5.0%.

NOTES:

1. f_{MAX}, min. limit specified is the frequency of the input pulse. The output frequency shall be one-half of the input frequency.
2. Tests shall be performed in sequence, attributes data only.
3. The limits specified for C_L = 15 pF are guaranteed but not tested.